REMARKS

By this Preliminary Amendment, applicants amend originally-filed claims 1-7 to comply with the U.S. Patent and Trademark Office practice and standards. No new matter has been added to the application. Amendments to the claims do not address any issues of patentability, and the amended claims are provided to place the application in better condition for allowance.

Likewise, the amendments to the specification are provided to correct grammatical and syntactical errors in the originally filed application. No new matter has been introduced into the application.

The amendments to the "Claims" are reflected in the attached "Version With Marked Changes Made."

Favorable consideration on the merits is respectfully requested.

Respectfully submitted,

Dated: March 18, 2002

By: _____

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5. The method ~~as claimed in~~according to claim 4, ~~characterized in that~~further comprising running the mobile program code ~~runs~~ on hardware provided for ~~the~~an open-loop or closed-loop control of the industrial installation ~~(30)~~.

6. The method ~~as claimed in~~according to claim ~~1 or 2, characterized in that~~1, wherein the installed mobile program code ~~for the closed-loop or open-loop control of the industrial installation (30)~~ is designed to monitor the industrial installation ~~(30)~~.

7. The method ~~as claimed in claim 6, characterized in that the mobile program code monitors~~according to claim 6, further comprising independently monitoring the industrial installation ~~(30) independently~~by means of the mobile program code for faults or special events, in the event of ~~a fault or a special event the~~which information needed to evaluate the fault or the special event ~~being~~is transmitted to the ~~evaluation center (40)~~remote location by means of the mobile program code, or a further mobile program code.

Version With Marked Changes Made

Patent Claims

1. A method of installing a mobile program code for the ~~closed-loop or open-loop~~ control of an industrial installation, ~~in particular an installation in the raw materials industry, the~~comprising transmitting a mobile program code ~~being transmitted~~ from ~~an evaluation center (40) or development center~~a remote location to the industrial installation~~, in particular~~ and installing and commissioning the ~~installation (30) in the raw materials industry, and being installed and commissioned~~code independently on the industrial installation ~~(30)~~.

2. The method ~~as claimed in~~according to claim 1, ~~characterized in that~~further comprising generating by means of the mobile program code ~~on the industrial installation (30) generates~~ further mobile program codes ~~in accordance with~~having a ~~predefined~~defined task, and ~~these~~transmitting the further mobile program codes ~~are~~to ~~transmitted~~and within the industrial installation ~~(30)~~.

3. A method ~~as claimed in~~according to claim 1, ~~characterized in that the~~wherein a mobile program codes ~~are~~is transmitted between the ~~evaluation center (40) or the development center~~remote location and the industrial installation ~~(30)~~ via ISDN, satellite, or Internet.

4. The method ~~as claimed in~~according to claim ~~1 or 2, characterized in that~~1, wherein the mobile program code is JAVA program code.

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PATENT

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TO ALL WHOM IT MAY CONCERN:

Be it known that WE, Joachim Hoehne and Thomas Helmke, citizens of Germany, whose post office addresses are Anton-Bruckner-Str. 13, 91052 Erlangen, Germany; and Taunusstrasse 33, 91056 Erlangen, Germany; respectively, have invented an improvement in:

METHOD OF MONITORING OR INSTALLING NEW PROGRAM CODES IN AN INDUSTRIAL INSTALLATION

of which the following is a

SPECIFICATION

FIELD OF THE INVENTION

[0001] The invention relates to a method of monitoring an industrial installation or installing new program codes in an industrial installation.

BACKGROUND OF THE INVENTION

COMPARISON

[0002] ~~For~~It is known, for the purpose of remote monitoring of industrial installations ~~as is known~~, to evaluate appropriate process logs and log files from ~~their~~the automation systems ~~are evaluated~~of the installations. Decisions, for example as to how warning messages are to be reacted to, can ~~as a result~~therefore be made only ~~with~~after a relatively large time delay, since the evaluation of the information is basically carried out offline. Special problems ~~are caused~~arise, for example, ~~by the fact that~~when installations and evaluation ~~center can be~~centers are located in different time zones, or ~~that~~where appropriately qualified personnel are not available on a 24 ~~hours per day~~-hour basis. It is therefore possible ~~that~~for an evaluation ~~is~~to be carried out ~~with~~only after some ~~hours~~amount of delay, and after the log files needed for the evaluation have already been overwritten. In addition, ~~as a result of the~~ random evaluation, makes it ~~is is not possible~~difficult to react to all fault messages, since not all the information is transmitted. For this reason, complete and comprehensive remote monitoring of an industrial installation is possible ~~is possible~~ only to a restricted extent. For industrial ~~installation~~installations, ~~in particular~~particularly installations in the raw materials industry, it is additionally desirable to improve the installation of program codes, in particular control program codes, for the closed-loop and open-loop control of the industrial installation, ~~in particular the installation in the raw materials industry,~~ and ~~its~~any subsystem. ~~Accordingly, it is an object of the invention to permit improved monitoring of a large industrial plant.~~

SUMMARY OF THE INVENTION

[0003] ~~According to the invention, the object is achieved by a method as claimed in claim 1. In this case,~~ Accordingly, it is an object of the invention to ~~permit~~provide improved monitoring of a large industrial plant~~.~~, through the use of a mobile program code for the closed-loop or open-loop control of an industrial installation, ~~in particular an installation~~for example in the raw materials industry~~;~~. The code is transmitted from an evaluation center or development center to the industrial installation~~, in particular the installation in the raw materials industry, and~~ which is installed and commissioned independently ~~on the industrial installation~~.

[0004] In ~~an advantageous refinement~~a preferred embodiment of the present invention, the installed mobile program code generates further mobile program codes in accordance with a predefined task, ~~said~~with the program codes being transmitted within the industrial installation. A preferred~~In an advantageous refinement of the invention, the~~ mobile program code is JAVA program code.

[0005] In ~~a further advantageous refinement~~another preferred embodiment of the invention, information is transmitted between the evaluation center or the development center and the industrial installation~~, in particular the installation in the raw materials industry~~, via ISDN, satellite or Internet.

~~**[0006]** In an advantageous refinement of the invention, the mobile program code is JAVA program code.~~

[0006] ~~[0007] In an advantageous refinement of the invention~~In yet a further preferred embodiment, the mobile program code runs on hardware provided for the open-loop or closed-loop control of the industrial installation~~, in particular the installation in the raw materials industry~~.

[0007] ~~[0008]~~ In a further ~~advantageous refinement~~embodiment of the invention, the installed mobile program code for the closed-loop and open-loop control of the industrial installation is designed to monitor the industrial installation. In this case, monitoring of an industrial installation~~, in particular an installation in the raw materials industry,~~ is carried out by means of a mobile program code which monitors the industrial installation~~, in particular the installation in the raw materials industry,~~ automatically for faults or special events~~, in~~. In the event of a fault or a special event, the information needed to evaluate the fault or the special event ~~being~~is transmitted by means of the mobile program code (or a further mobile program code) to an evaluation center separated physically from the industrial installation~~, in particular the installation in the raw materials industry. In this case, special~~ Special events are to be understood as including violations of limiting values ~~or~~, trends, or the occurrence of regular print-outs of particular significance. Special events ~~can in addition~~may also be a tolerance deviation of process data (strip profile faults, temperature faults, ~~and so on~~etc.), or special features in the convergence behavior in the adaptation of models. In this way, ~~much~~ faster and more comprehensive evaluation of faults~~, limiting value violations~~ and ~~so~~special ~~on~~events is possible. It is further of particular advantage to carry out

the recognition of trends of looming faults by means of the information determined by the mobile program code. This permits, for example, preventative maintenance of a ~~correspondingan~~ installation.

[0008] ~~**[0009]**~~ In ~~an advantageous refinement~~a further preferred embodiment of the present invention, the mobile program code forms and dispatches new mobile program code~~, the~~. The new mobile program code ~~monitoring~~monitors parts of the industrial installation~~, in particular the installation in the raw materials industry,~~ automatically for faults or special events~~, in~~. In the event of a fault or a special event, the information needed to evaluate the fault or the special event ~~being~~is transmitted directly to the evaluation center or~~, in particular~~ to another mobile program code for further transmission to the evaluation center~~, to another mobile program code~~.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The invention is described below in greater detail in connection with the drawing, in which:

[0010] ~~Further advantages and details emerge from the following description of an exemplary embodiment.~~Figure 1 schematically illustrates~~The FIG shows, in an exemplary configuration,~~ an industrial installation ~~30, illustrated schematically, with its~~having a control system and its actuators and sensors~~, without the actual process sequence.~~.

DETAILED DESCRIPTION OF THE INVENTION

[0011] ~~The FIG shows, in an exemplary configuration, an industrial installation 30, illustrated schematically, with its control system and its actuators and sensors, without the actual process sequence.~~ The industrial installation 30 has an industrial Ethernet bus 9, which provides a data connection between two identically or differently configured automation devices 5 and 6, an operating computer 4 and a commissioning computer 1. The industrial Ethernet bus 9 is connected to a standard Ethernet bus 8 via a computer 7. An operating computer 2 and a central operating computer 3 are connected to the standard Ethernet bus 8. Via a bus system 23, which is designed as a Profibus, various actuators or sensors 12, 13, 14, 15 are provided with a data connection to the automation device 5. Furthermore, a decentralized peripheral 10 is connected to the automation device 6 via the bus system 23. Via a bus system 24, which is designed as a Profibus, various actuators or sensors 16, 17, 18, 19 are provided with a data connection to the automation device 6. Furthermore, a decentralized peripheral 11 is connected to the automation device 6 via the bus system 24. Via the decentralized peripheral 11, various actuators and sensors 20, 21, 22 can be driven or evaluated via the automation device 6. The operating computers 2, 3, 4, the automatic devices 5, 6, the decentralized peripherals 10, 11, the actuators or sensors 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22 and the bus systems 8, 9, 23, 24 serve the operation of the industrial installation.

[0012] Reference ~~symbol~~number 40 designates an evaluation center that is ~~separated~~ physically remote from the industrial installation 30 and is advantageously also used as a development center. In an exemplary configuration, the evaluation center 40 has a computer system having, for example, a plurality of computers 41 and 42 coupled via a bus system 43. A communication link 50 provides a data connection between the industrial plant 30 and the evaluation center 40. In this case, this does not have to be a ~~so-called~~ dedicated line. In an exemplary configuration, the industrial plant ~~30~~30, and the evaluation center 40 have a data connection to each other via the commissioning computer 1 on the side of the industrial installation ~~30~~30, and the computer 41 on the side of the evaluation center 40. In order to monitor the industrial installation 30, mobile program code is transmitted from the computer 41 to the commissioning computer 1. By means of the transmitted mobile program code, which runs on the commissioning computer 1, the other components 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22 are monitored for faults or special events~~, such as limiting value violations~~. For this purpose, the mobile program code operating on the commissioning computer 1 automatically generates further mobile program codes, which are transmitted from the commissioning computer 1 to the automation devices 5, 6, the decentralized peripherals 10 and ~~11 and~~11, to the actuators or sensors 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, ~~22~~22, and~~,~~ if appropriate~~,~~ to the operating computers 2, 3, 4. If one of these transmitted mobile program codes detects a fault or the special event~~,~~ then this mobile program code transmits a

communication relating to this fault or the special event, and also all the information needed for evaluation to the mobile program code installed on the commissioning computer 1, which sets up the communications link 50 to the computer 41 and then transmits this information to the computer 41. The transmitted information can~~, for example,~~ be log files which are generated on the basis of warning and error messages~~.~~ ~~Furthermore~~, or it may be tolerance deviations of process data (for example, strip profile faults, temperature faults~~ and so on~~, etc.), adaptation coefficients or coefficients from neural networks and the states of computers (~~for~~such ~~example~~as memories, hard disk capacity, and CPU loading~~ and so on~~). In addition, provision can be made to register the frequency of warning messages and to evaluate it statistically.

[0013] The mobile program code is ~~particularly advantageously~~preferably implemented in JAVA. This ~~is~~may ~~preferably~~be carried out by following the Aglet concept, as disclosed by D.B. Lange, M. Oshima: "Programming and Developing JAVA Mobile Agents with Aglets", Edison-Wesley, 1998. ~~The~~One preferred application of the invention is~~ used particularly advantageously~~ in rolling mills.

~~Patent~~We ~~claims~~claim:

1. A method of installing a mobile program code for the ~~closed-loop or open-loop~~ control of an industrial installation, ~~in particular an installation in the raw materials industry, the~~comprising transmitting a mobile program code ~~being transmitted~~ from ~~an evaluation center (40) or development center~~a remote location to the industrial installation~~, in particular~~ and installing and commissioning the ~~installation (30) in the raw materials industry, and being installed and commissioned~~code independently on the industrial installation ~~(30)~~.

2. The method ~~as claimed in~~according to claim 1, ~~characterized in that~~further comprising generating by means of the mobile program code ~~on the industrial installation (30) generates~~ further mobile program codes ~~in accordance with~~having a ~~predefined~~defined task, and ~~these~~transmitting the further mobile program codes ~~are~~to ~~transmitted~~and within the industrial installation ~~(30)~~.

3. A method ~~as claimed in~~according to claim 1, ~~characterized in that the~~wherein a mobile program codes ~~are~~is transmitted between the ~~evaluation center (40) or the development center~~remote location and the industrial installation ~~(30)~~ via ISDN, satellite, or Internet.

4. The method ~~as claimed in~~according to claim ~~1 or 2, characterized in that~~1, wherein the mobile program code is JAVA program code.

5. The method ~~as claimed in~~according to claim 4, ~~characterized in that~~further comprising running the mobile program code ~~runs~~ on hardware provided for ~~the~~an

open-loop or closed-loop control of the industrial installation ~~(30)~~.

6. The method ~~as claimed in~~according to claim ~~1 or 2, characterized in that~~1, wherein the installed mobile program code ~~for the closed-loop or open-loop control of the industrial installation (30)~~ is designed to monitor the industrial installation ~~(30)~~.

7. The method ~~as claimed in claim 6, characterized in that the mobile program code monitors~~according to claim 6, further comprising independently monitoring the industrial installation ~~(30) independently~~by means of the mobile program code for faults or special events, in the event of ~~a fault or a special event the~~which information needed to evaluate the fault or the special event ~~being~~is transmitted to the ~~evaluation center (40)~~remote location by means of the mobile program code, or a further mobile program code.

~~Abstract~~Method of monitoring or installing new program codes in an industrial installation

A method of monitoring an industrial installation, in particular an installation in the raw materials industry, by means of a mobile program code, which monitors the industrial installation, in particular the installation in the raw materials industry, automatically for faults or special events, in the event of a fault or a special event, the information needed to evaluate the fault or the special event being transmitted by means of the mobile program code or a further mobile program code to an evaluation center separated physically from the industrial installation, in particular the installation in the raw materials industry.

~~FIG.~~